Vol. VI No. 1
1978

MEMBRANE FILTRATION TECHNIQUE FOR FILARIASIS SURVEILLANCE, IN SEMARANG

Arbain Joesoef[1] and David T. Dennis[2]

Berbagai cara dalam pengambilan dan pengolahan sediaan darah dalam pemeriksaan adanya microfilaria pada penderita atau tersangka penderita telah dilaporkan dimana salah satu diantaranya adalah dengan penyaringan darah vena dengan nuclepore membrane. Penelitian telah dilakukan di daerah endemis Wuchereria bancrofti Semarang untuk mengetahui manfaat cara ini dengan cara sediaan darah tebal yang diambil dari ujung jari yang digunakan dalam program pemberantasan penyakit filaria di Indonesia. Dari penelitian ini ditemukan bahwa penggunaan cara saringan darah tidak hanya berhasil menemukan microfilaria pada penderita dengan jumlah yang rendah didalam peredaran darahnya tetapi juga menemukan microfilaria ini pada penderita dimana pada pemeriksaan sediaan darah tebal microfilaria tidak ditemukan karena hilang selama pengolahan.

The 20 ul thick blood film is the standard method of detecting microfilariae in surveys of the National Filariasis Control Program. Thick films are rapid and inexpensive and they can be prepared and examined simply with minimum equipment. There are, however, situations in which a more sensitive method would be useful, for example in screening a suspected new focus or in making post-treatment evaluations of control programs. The nuclepore method of filtering microfilariae from blood is highly sensitive, rapid and reliable, requires little equipment and is workable in the field (Dennis and Kean, 1971; Dennis, et al, 1976). This study was conducted as a small comparative trial of conventional thick film and nuclepore filtration techniques to see if membrane filtration would be practical for use by staff of the National Filariasis Control Program in Indonesia.

MATERIALS AND METHODS

The study was conducted in January 1977 in the village of Bojong Salaman, Semarang Municipality, on the north coast of Central Java. Infections with nocturnally periodic *Wuchereria bancrofti* were recently reported from Semarang for the first time (Arbain and Hidayat, 1977).

Paired finger-tip and venous blood specimens were obtained between the hours of 20:00-22:00 from 88 persons selected at random. Twenty ul aliquots of finger-tip blood were taken with a hemoglobin pipette and made into standard thick films on carefully cleaned glass slides. Films were dried overnight and stained in 10 per cent buffered Giemsa solution for 15 minutes the following morning. For membrane filtration, 2 ml venous blood samples were taken with 2.5 ml disposable needles and syringes, transferred to vacutainer tubes containing 0.5 cc of 3.4 per cent sodium citrate and mixed carefully. On the following morning, each blood was passed through a separate nuclepore filter with a pore diameter of 3 um held in a Swinney adapter, and the membrane then washed by passing small amounts of clean water through it. Each membrane was placed on a microscope slide, air-dried and fixed with methanol. The specimens were stained for 15 minutes in 10 per cent buffered Giemsa solution and examined under medium power of a binocular micros-

1) Directorate General of Communicable Disease Control, Ministry of Health, Jakarta.
2) U.S. Naval Medical Research Unit No. 2 Jakarta Detachment.
Received 30 March 1978.

cope. The total numbers of microfilariae and the species in the thick films and filters were recorded.

RESULTS

Of the 88 persons examined by both methods, 6 (6.8 per cent) were found to be microfilaraemic by the standard 20 ul thick film, and 13 (14.5 per cent) were positive by membrane filtration (Table 1). The 6 persons positive by thick film were also positive by the filtration technique. Seven persons were positive when examined by membrane filtration but negative using the conventional thick films. Four of these 7 persons had very low microfilaria counts of 10 parasites or less per ml of filtered blood (case no. 's 521, 525, 597 and 875), but the other 3 cases (no.'s 323, 604, 929) had parasite levels which might be expected to have been detected by examining 20 ul finger-tip blood (table 2). Two ml of blood is 100 times the volume of a

Table 1. Comparison Between Conventional Thick Blood Film Technique and Membrane Filtration in Filariasis Surveillance.

TECHNIQUE USED	NUMBER EXAMINED	NUMBER (%) POSITIVE
Finger-tip blood, 20 ul thick films	88	6 (6.8)
Venous blood, 2 ml membrane filtration	88	13 (14.8)

Table 2. Comparison Between Microfilaria Count Of Conventional Thick Blood Film Technique and Membrane Filtration Technique In Microfilaria Survey.

Case Number	Microfilaria count in	
	Thick Films	Filters
53	17	2,938
78	18	2,472
134	3	488
161	1	410
174	108	2,552
233	5	317
323	0	569
521	0	10
525	0	1
597	0	4
604	0	152
875	0	20
929	0	1,010
Total	152	10,943

20 ul thick film, and with but 1 exception (no. 174) the number of parasites per filter compared to number per thick film was about equal to or greater than 100:1.

DISCUSSION

Practical methods for filtering blood for microfilariae using membrane filters were first reported several years ago. The great increase in sensitivity that filters offer has been counterbalanced by their cost (about US$ 0.17 a piece) and the need to draw venous blood, so that use of filters has been limited to selected circumstances. Filters are particularly well adapted for doing spot surveys in areas of low endemicity, suspected new foci, or among populations previously treated with diethylcarbamazine, since their use can detect persons with very low parasite densities.

More than twice the percentage of persons found positive with conventional blood films were positive using filters in Semarang, and differences such as this could be important in planning surveillance and control programs in Indonesia. Filtration not only detected extremely low numbers of circulating microfilariae but also identified 3 cases (no.'s 323, 604, 929) in which microfilariae may have been lost from thick films during processing. Fewer than expected numbers of microfilariae were found on 1 filter (case no. 174), and this may have been caused by leakage of blood around an ill-fitting gasket of the Swinney adapter during filtering.

SUMMARY

The nuclepore membrane technique of filtering blood was used in filariasis surveillance conducted in Semarang Municipality, Central Java, in Januari 1977. The number of carriers detected in a sample of 88 persons by membrane filtration of 2 ml venous blood was 2.2 times that found by the conventional 20 ul thick smear technique. Sampling of 2 ml venous blood taken by 2.5 ml syringes was well accepted by the persons surveyed. The technique is simple, rapid, reliable and practical to use. The membrane filtration technique will be useful in surveillance and post-treatment evaluations undertaken by staff of the National Filariasis Control Program.

ACKNOWLEDGMENT

The authors wish to express gratitude to Dr. Bahrawi Wongsokoesoemo, M.P.H., Director General for Communicable Disease Control, Ministry of Health; Prof. Dr. J. Sulianti Saroso, Head, National Institute of Health Research and Development, Ministry of Health; and Dr. Kurt Sorensen, Commanding Officer, U.S. Naval Medical Research Unit No. 2, Taipei for their encouragement and administrative support. We thank the following individuals who contributed to this study: Dr. Isdiarto Hidayat, Sunaryoprapto, Moh. Yasin and Margreet Juanda.

REFERENCES

Arbain, J., and Isdiarto Hidayat, 1977. New focus of bancroftian filariasis in Semarang Municipality. Bull. Hlth. Studies in Ind. 5 (2):19

Dennis, D.T. and Kean, B.H., 1971. Isolation of Microfilariae: Report of a New Method. J. Parasit. 57:1146

Dennis, D.T., McConnel, E., and White, G.B., 1976. Bancroftian filariasis and membrane filters: are night surveys necessary. Am. J. Trop. Med. Hyg. 25:257